Integrating and Using Highly Dynamic Data With Relatively Infrequently Updated GIS Data

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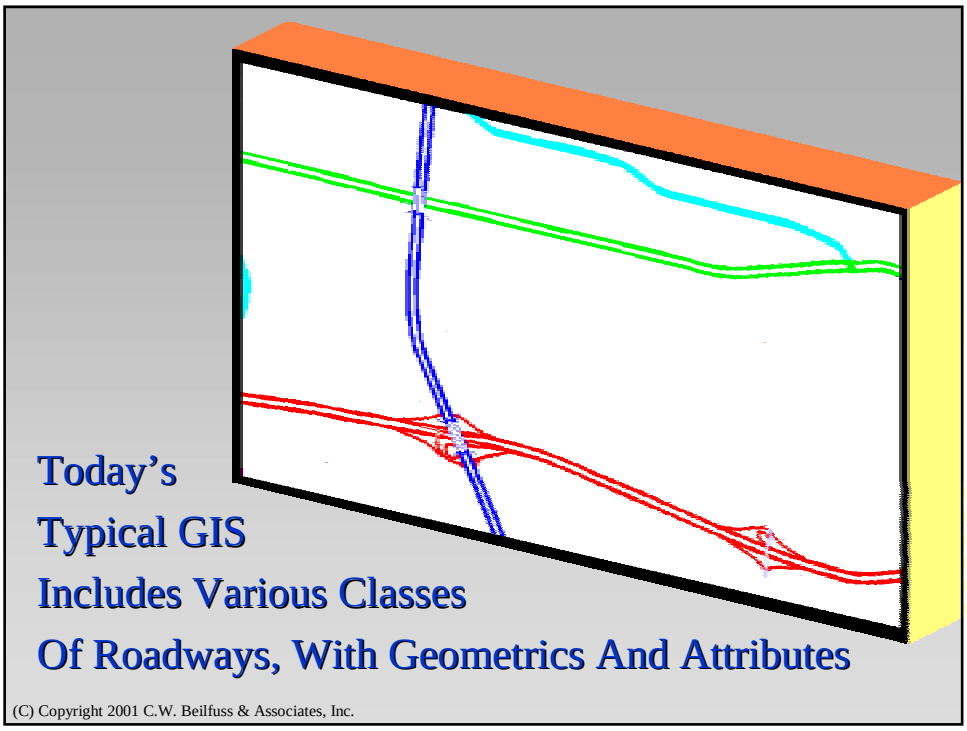
Introduction

- GIS Data in Most Organizations Has Progressed to a Fairly "Complete" State
- GIS Data in Most Organizations is Released to the "Customer" on an Infrequent Basis
- A Wider Base of Users Is Recognizing Benefits in the Use of GIS Data
- Most "Customers" Have a Real Need to Relate Other Very Dynamic Data to GIS Data

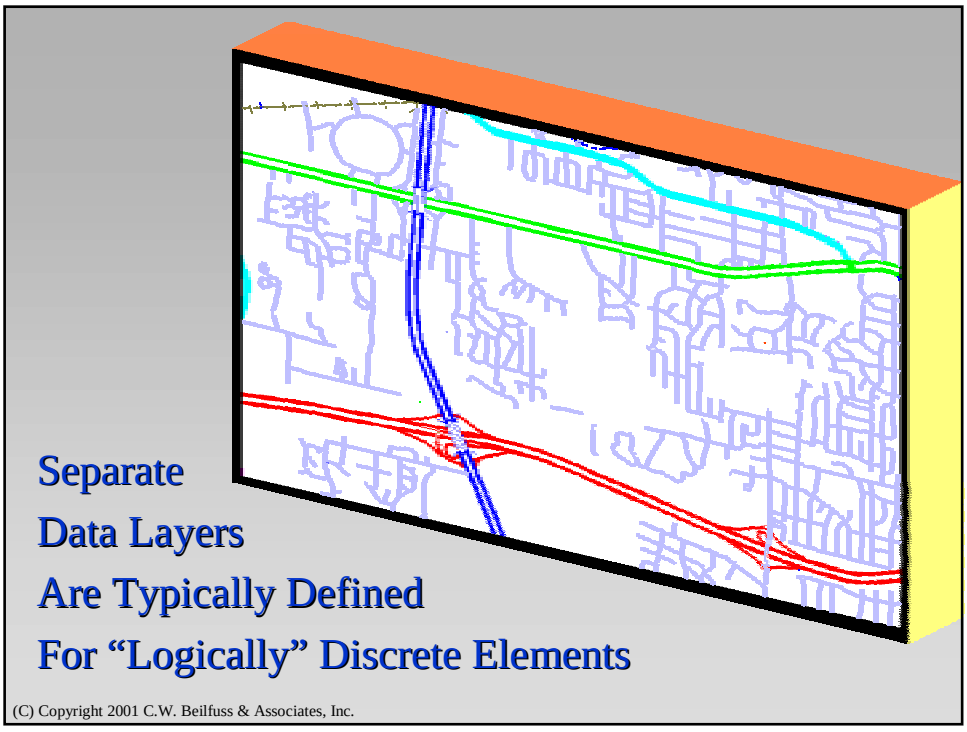
Presentation Questions

- What Is "Dynamic" Data and Why Do We Want to Relate It to GIS Data?
- How Well Can GIS Data Be Integrated With Dynamic Data?
- What Is the Affect of GIS Data
  - Currency
  - Accuracy
  - Design / Intent

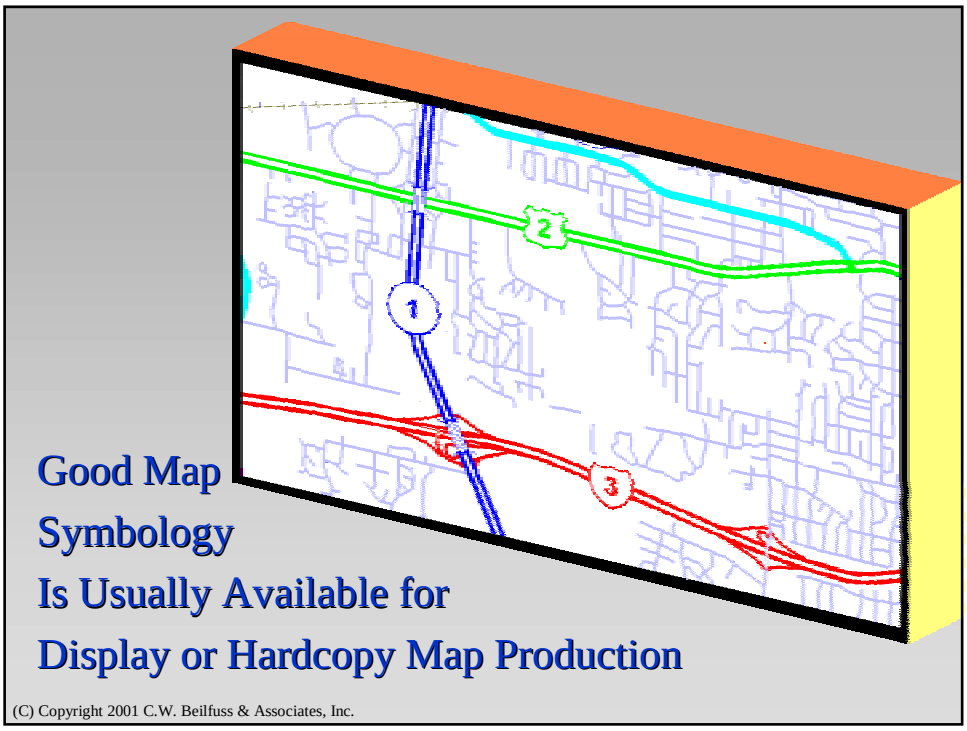
Overview of GIS (for Transportation) Today



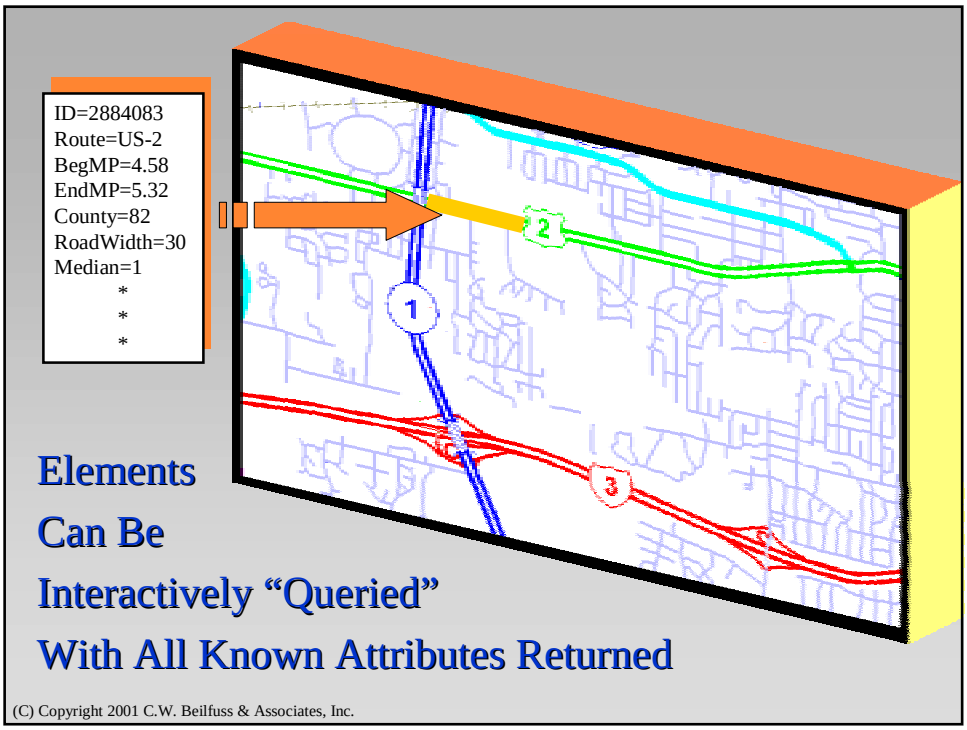
Today's
Typical GIS
Includes Various Classes
Of Roadways, With Geometrics And Attributes



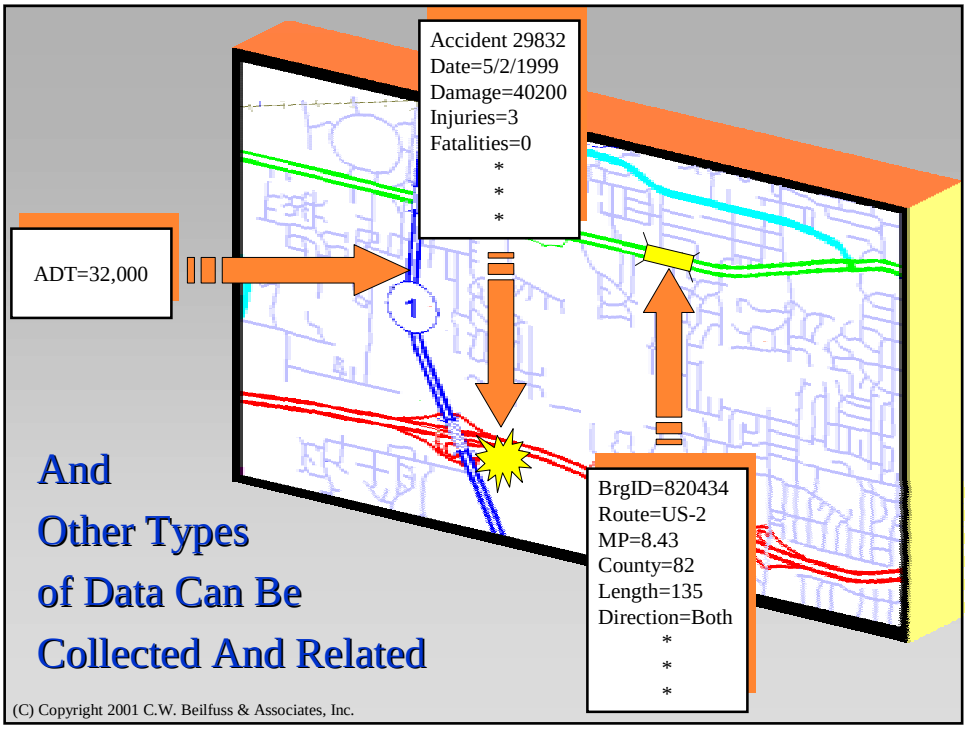
Separate
Data Layers
Are Typically Defined
For "Logically" Discrete Elements



Good Map Symbology Is Usually Available for Display or Hardcopy Map Production



Elements Can Be Interactively "Queried" With All Known Attributes Returned



"Static" Data Relation

The data in the previous examples would most likely be related

- By Lat / Long,
- To a Specific Link / Arc ID,
- or Possibly by Milepoint (LRS).

The GIS Engine Would Make the Relation "One Time".

"Dynamic" Data Relation

- But What Happens When
  - More Functionality Is Needed Than Reviewing "Planning" or Manually Analyzable Output
  - Dynamic Data Needs to Be Related?
  - There Is No Lat / Long or Link / Arc IDs?
  - The Data Is Range Based?
  - Data Needs to Be Validated, Related, and Analyzed in Real-Time Without the Ability to Build Elements to Be Dynamically Segmented?

Why "Dynamic" Data Relation

"The roadway will probably be there tomorrow, but I have no idea what may be happening on or around it."

"My GIS is not designed for or is not current enough to be updated and analyzed in real-time."

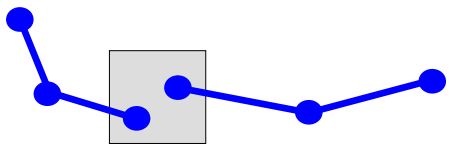
"I need to provide better interactive capabilities for Construction, Weather, Natural Disasters, Traffic Monitoring...."

Problems With Today's GIS

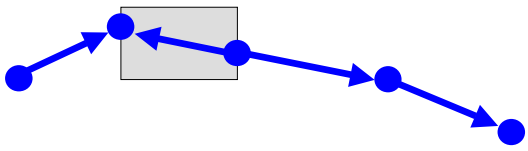
- **Currency**
  - Only released periodically. Either not up to date or in a state of flux at all other times.
- **Quality**
  - Data may have good precision or resolution, but may have other definition problems. (See following examples)
- **Intent**
  - Data / System not designed for extensive, wide scale, dynamic relation and analysis.

Review of Quality Problems

Mismatched Nodes

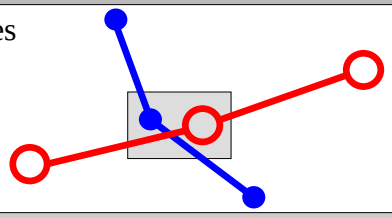


Conflicting Directional Definition

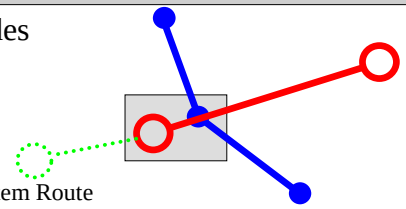


Review of Quality Problems

Mismatched Nodes

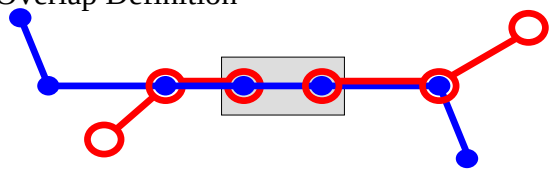


Mismatched Nodes

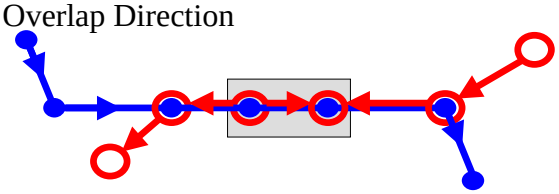


Review of Quality Problems

Incomplete Overlap Definition



Conflicting Overlap Direction



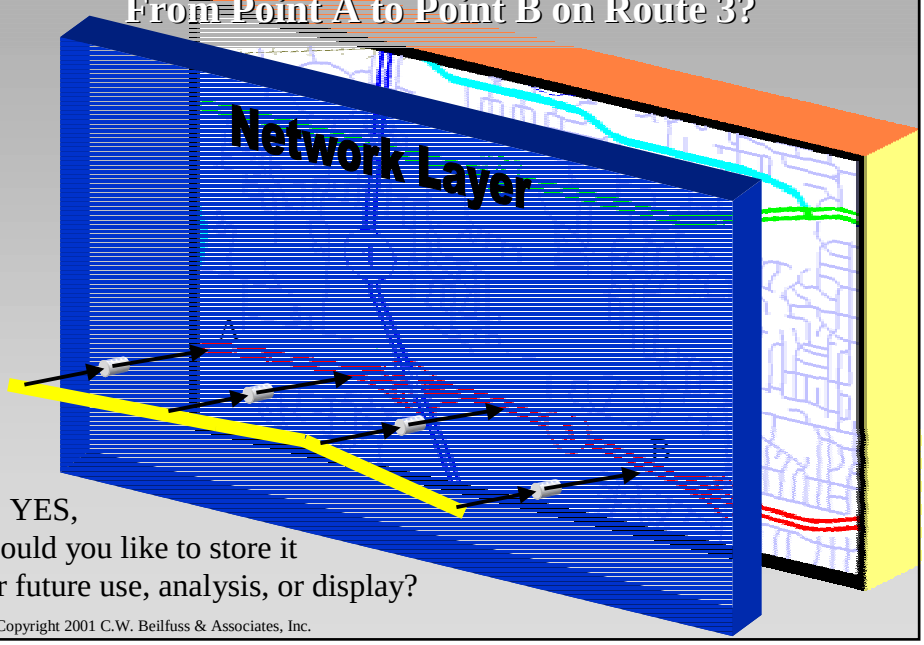
Why Are These Problems

- Currency
  - If a master GIS is not “valid” for public use at all times, storing dynamic data in it becomes difficult.
- Accuracy
  - Lat / Long or segment based relationships can hide underlying data problems. Range, directional, or route connectivity issues cannot be hidden.
- Intent
  - It is always hard to make an object perform an action for which was it not designed.

Network-Based Solution

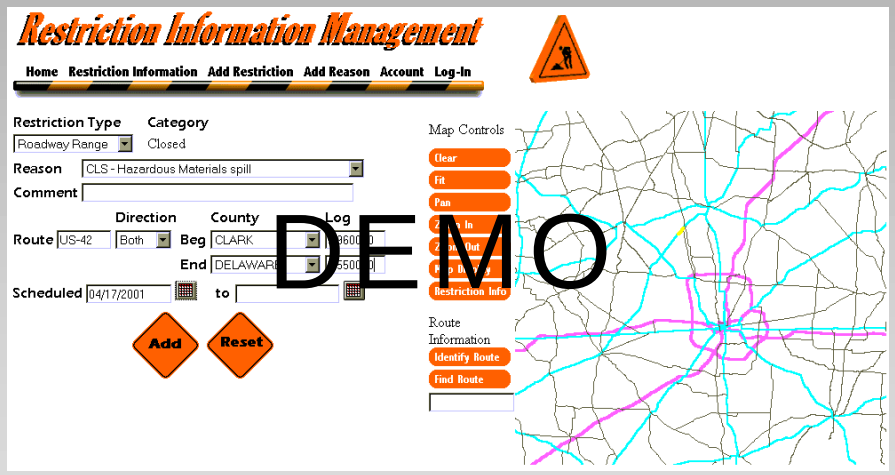
- This Is GIS-T
  - All of the “T” (Transportation) is Network Based
- A Network on Top of the GIS Provides a Level of Intelligence and Designed Intent to Provide Dynamic Validation, Relation, and Analysis
- GIS Data Currency and Intent Problems Can Be Overcome through the Network Layer
- Accuracy Issues Will Be Identified & Corrected through the Creation of a Solid Network

Is It Valid to Create A Definition of Some Condition From Point A to Point B on Route 3?



YES,
Would you like to store it
for future use, analysis, or display?

A Dynamic Data, Network-Based GIS Data Integration Example



Benefits

- Getting to the Point Where a Solid Network Exists Is a Tremendous Benefit Itself - So Many Additional Uses Are Possible
- Through the Use of a Network Layer, the Relatively “Static” GIS Data Can Continue to be Well Maintained, Tested, and Released Infrequently Without Limiting the Ability to Relate Dynamic Data

Benefits

- When Dynamic Data Can Be Related, the Number of Users That Can Benefit from the Underlying GIS Data Will Grow and the Importance of GIS Will Follow
- Evaluation, Tracking, and Planning Processes That Either Do Not Exist or Are Totally Manual Will Be Greatly Aided or Entirely Automated

Benefits

- More Information Can Be Maintained Easier and More Accurately
- More Information Can Be Assembled, Reviewed, and Presented Faster
- More Users Can Benefit in Terms of Time-Savings, Improved Safety, and Increased Available Information

Questions